

**WHAT IS CLAIMED IS:**

1           1. A node of a radio access telecommunications network which allocates one of  
 2 plural Orthogonal Variable Spreading Factor (OVSF) codes to a radio access  
 3 connection for use as a channelization code, the plural Orthogonal Variable Spreading  
 4 Factor (OVSF) codes being defined by a binary code tree structure having a root and  
 5 plural code levels, each node of the tree corresponding to one code and having a  
 6 spreading factor defined by its level (k) in the tree structure, and wherein, when a code  
 7 of level  $k = i$  is requested for the connection, the node selects as an allocated OVSF  
 8 code a free code of the  $i^{\text{th}}$  level whose subtree structure from the root of the code tree  
 9 has a largest combined weight, the combined weight being a sum of weights for all  
 10 codes that are allocated in the subtree.

2           2. The apparatus of claim 1, wherein the weights are values related to duration  
 of allocation.

3           3. The apparatus of claim 1, wherein the weights values which are statistically  
 derived.

4           4. The apparatus of claim 1, wherein the weights are values based on service  
 type.

5           5. The apparatus of claim 1, wherein the weights are values based on individual  
 user behavior.

6           6. The apparatus of claim 1, wherein in selecting the allocated OVSF code the  
 node performs the steps of:

- 7           (a) setting a start code in the code tree as a current code;
- 8           (b) selecting at least one code descendant from the current code(s) on a next  
 9 active code level;
- 10          (c) from the code(s) selected in step (b), selecting at least one code which has  
 at least one code of level  $i$  available;
- (d) from the code(s) selected at step (c), selecting a code(s) which has the  
 largest combined weight;
- (e) allocating one of the code(s) selected at step (d) if level thereof is level  $i$ ;

- (f) if the code(s) selected at step (d) is not of level  $i$ , setting the code(s) selected at step (d) as the current code(s) and continuing with step (b).

7. The apparatus of claim 6, wherein if all codes are equally weighted, step (d) involves selecting, from the code(s) selected at step (c), a code(s) which has a greatest number of users in its subtree.

8. The apparatus of claim 6, wherein if more than one code is selected at step (d), as step (e) the allocated code is selected according to a predetermined strategy.

9. The apparatus of claim 6, wherein if more than one code is selected at step (d), as step (e), a first such code selected at step (d) is selected as the allocated code.

10. The apparatus of claim 1, wherein the node is a radio network controller (RNC) node of the radio access network.

11. A radio access telecommunications network comprising:  
 a radio access controller (RNC) node;  
 a base station node connected to the radio access controller (RNC) node;  
 a user equipment unit which communicates via a connection across an air interface with the base station node using an allocated Orthogonal Variable Spreading Factor (OVSF) code;  
 a code allocation unit at one of the nodes which allocates, for use as a channelization code, one of plural Orthogonal Variable Spreading Factor (OVSF) codes to a radio access connection as the allocated Orthogonal Variable Spreading Factor (OVSF) code, the plural Orthogonal Variable Spreading Factor (OVSF) codes being defined by a binary code tree structure having a root and plural code levels, each node of the tree corresponding to one code and having a spreading factor defined by its level ( $k$ ) in the tree structure, and wherein, when a code of level  $k = i$  is requested for the connection, the node selects as the allocated OVSF code a free code of the  $i^{\text{th}}$  level whose subtree structure from the root of the code tree has a largest combined weight, the combined weight being a sum of weights for all codes that are allocated in the subtree.

12. The apparatus of claim 11, wherein the weights are values related to duration of allocation.

1           13. The apparatus of claim 11, wherein the weights are statistically derived.

1           14. The apparatus of claim 11, wherein the weights are values which are based  
2 on service type.

1           15. The apparatus of claim 11, wherein the weights are values based on  
2 individual user behavior.

1           16. The apparatus of claim 11, wherein in selecting the allocated OVSF code  
the code allocation unit performs the steps of:

- (a) setting a start code in the code tree as a current code;
- (b) selecting at least one code descendant from the current code(s) on a next active code level;
- (c) from the code(s) selected in step (b), selecting at least one code which has at least one code of level *i* available;
- (d) from the code(s) selected at step (c), selecting a code(s) which has the largest combined weight;
- (e) allocating one of the code(s) selected at step (d) if level thereof is level *i*;
- (f) if the code(s) selected at step (d) is not of level *i*, setting the code(s) selected at step (d) as the current code(s) and continuing with step (b).

1           17. The apparatus of claim 16, wherein if all codes are equally weighted, step  
2 (d) involves selecting, from the code(s) selected at step (c), a code(s) which has a  
3 greatest number of users in its subtree.

1           18. The apparatus of claim 16, wherein if more than one code is selected at step  
2 (d), as step (e) the allocated code is selected according to a predetermined strategy.

1           19. The apparatus of claim 16, wherein if more than one code is selected at step  
2 (d), as step (e), a first such code selected at step (d) is selected as the allocated code.

1           20. The apparatus of claim 11, wherein the code allocation unit is situated at a  
2 radio network controller node.

1        21. A method of allocating one of plural Orthogonal Variable Spreading Factor  
 2 (OVSF) codes to a connection in a radio access network for use as a channelization  
 3 code, the plural Orthogonal Variable Spreading Factor (OVSF) codes being defined by  
 4 a binary code tree structure having a root, each node of the tree corresponding to one  
 5 code and having a spreading factor defined by its level (k) in the tree structure, and  
 6 wherein, when a code of level  $k = i$  is requested for the connection, the method  
 7 comprises selecting as an allocated OVSF code a free code of the  $i^{\text{th}}$  level whose  
 8 subtree structure from the root of the code tree has a largest combined weight, the  
 9 combined weight being a sum of weights for all codes that are allocated in the subtree.

22. The method of claim 21, wherein the weights are values related to duration  
 of allocation.

23. The method of claim 21, wherein the weights are statistically derived.

24. The method of claim 21, wherein the weights are values based on service  
 type.

25. The method of claim 21, wherein the weights are values based on  
 individual user behavior.

1        26. The method of claim 21, further comprising selecting the allocated OVSF  
 2 code by performing the following steps:

- 3        (a)    setting a start code in the code tree as a current code;
- 4        (b)    selecting at least one code descendant from the current code(s) on a next
- 5        active code level;
- 6        (c)    from the code(s) selected in step (b), selecting at least one code which has
- 7        at least one code of level  $i$  available;
- 8        (d)    from the code(s) selected at step (c), selecting a code(s) which has the
- 9        largest combined weight;
- 10       (e)    allocating one of the code(s) selected at step (d) if level thereof is level  $i$ ;
- 11       (f)    if the code(s) selected at step (d) is not of level  $i$ , setting the code(s)
- 12       selected at step (d) as the current code(s) and continuing with step (b).

1        27. The method of claim 26, wherein step (d) involves comprises, if all codes  
2 are equally weighted, selecting, from the code(s) selected at step (c), a code(s) which  
3 has a greatest number of users in its subtree.

1        28. The method of claim 26, wherein if more than one code is selected at step  
2 (d), as step (e) the allocated code is selected according to a predetermined strategy.

3        29. The method of claim 26, wherein if more than one code is selected at step  
4 (d), as step (e), a first such code selected at step (d) is selected as the allocated code.

1        30. The method of claim 21, wherein the method is performed by a radio  
2 network controller (RNC) node of the radio access network, and wherein the method  
3 further comprises:

4            transmitting the allocated OVSF code to a base station node; and  
5            transmitting the allocated OVSF code to a user equipment unit for use by the  
6 user equipment unit in communicating over an air interface with the base station node.

1        31. The method of claim 30, wherein the method further comprises transmitting  
2 the allocated OVSF code to the base station node using a NODE B APPLICATION  
3 PART (NBAP) message.

1        32. The method of claim 31, further comprising using one of the following  
2 NODE B APPLICATION PART (NBAP) messages to transmit the allocated OVSF  
3 code to the base station node: COMMON TRANSPORT CHANNEL SETUP  
4 REQUEST message; CELL SETUP REQUEST message; RADIO LINK SETUP  
5 REQUEST message; RADIO LINK ADDITION REQUEST message; RADIO LINK  
6 RECONFIGURATION PREPARE message, and COMPRESSED MODE PREPARE  
7 message.

1        33. The method of claim 30, wherein the method further comprises transmitting  
2 the allocated OVSF code to the user equipment unit using a radio resource control  
3 (RRC) message.

1        34. The method of claim 33, further comprising using one of the following  
2 messages to transmit the allocated OVSF code to the user equipment unit: PHYSICAL

3 CHANNEL RECONFIGURATION message; TRANSPORT CHANNEL  
 4 RECONFIGURATION message; RADIO BEARER SETUP message; RADIO  
 5 BEARER RELEASE message; RADIO BEARER RECONFIGURATION message;  
 6 RADIO RESOURCE CONTROL (RRC) CONNECTION SETUP message; ACTIVE  
 7 SYSTEM UPDATE message; and SYSTEM INFORMATION message.

1 35. A node of a radio access telecommunications network which allocates one  
 2 of plural Orthogonal Variable Spreading Factor (OVSF) codes to a radio access  
 3 connection for use as a channelization code, the plural Orthogonal Variable Spreading  
 4 Factor (OVSF) codes being defined by a binary code tree structure having a root and  
 plural code levels, each node of the tree corresponding to one code and having a  
 spreading factor defined by its level (k) in the tree structure, and wherein, when a code  
 of level  $k = i$  is requested for the connection, the node selects as an allocated OVSF  
 code a free code of the  $i^{\text{th}}$  level whose subtree structure from the root of the code tree  
 has a greatest number of users.

36. The apparatus of claim 1, wherein in selecting the allocated OVSF code the  
 node performs the steps of:

- (a) setting a start code in the code tree as a current code;
- (b) selecting at least one code descendant from the current code(s) on a next  
 active code level;
- (c) from the code(s) selected in step (b), selecting at least one code which has  
 at least one code of level  $i$  available;
- (d) from the code(s) selected at step (c), selecting a code(s) which has the  
 greatest number of users;
- (e) allocating one of the code(s) selected at step (d) if level thereof is level  $i$ ;
- (f) if the code(s) selected at step (d) is not of level  $i$ , setting the code(s)  
 selected at step (d) as the current code(s) and continuing with step (b).

37. The apparatus of claim 36, wherein if more than one code is selected at step  
 (d), as step (e) the allocated code is selected according to a predetermined strategy.

38. The apparatus of claim 36, wherein if more than one code is selected at step  
 (d), as step (e), a first such code selected at step (d) is selected as the allocated code.

1           39. The apparatus of claim 35, wherein the node is a radio network controller  
2 (RNC) node of the radio access network.

1           40. A method of allocating one of plural Orthogonal Variable Spreading Factor  
2 (OVSF) codes to a connection in a radio access network for use as a channelization  
3 code, the plural Orthogonal Variable Spreading Factor (OVSF) codes being defined by  
4 a binary code tree structure having a root, each node of the tree corresponding to one  
5 code and having a spreading factor defined by its level (k) in the tree structure, and  
6 wherein, when a code of level  $k = i$  is requested for the connection, the method  
7 comprises selecting as an allocated OVSF code a free code of the  $i^{\text{th}}$  level whose  
8 subtree structure from the root of the code tree has a greatest number of users.

1           41. The method of claim 40, further comprising selecting the allocated OVSF  
2 code by performing the following steps:

- 3           (a) setting a start code in the code tree as a current code;  
4           (b) selecting at least one code descendant from the current code(s) on a next  
5 active code level;  
6           (c) from the code(s) selected in step (b), selecting at least one code which has  
7 at least one code of level  $i$  available;  
8           (d) from the code(s) selected at step (c), selecting a code(s) which has the  
9 greatest number of users;  
10           (e) allocating one of the code(s) selected at step (d) if level thereof is level  $i$ ;  
11           (f) if the code(s) selected at step (d) is not of level  $i$ , setting the code(s)  
12 selected at step (d) as the current code(s) and continuing with step (b).

1           42. The method of claim 41, wherein if more than one code is selected at step  
2 (d), as step (e) the allocated code is selected according to a predetermined strategy.

1           43. The method of claim 41, wherein if more than one code is selected at step  
2 (d), as step (e), a first such code selected at step (d) is selected as the allocated code.